FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 780. (No. 49, Vol. XV.) DECEMBER 6, 1923 [Weekly, Price 6d. Post free, 7d.

Flight

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C. 2
Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828
Annual Subscription Rates, Post Free:
United Kingdom .. 30*s.* 4*d.* Abroad .. .. 33*s.* 0*d.**
These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates
* *European subscriptions must be remitted in British currency*

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Dec. 14 .... **"Leader Cable Systems for Electrical Steering of Aeroplanes," by J. Gray, before I.Ae.E.**

1924

Jan. 9 .... **"Water-Cooled Aero Engines," by A. J. Rowledge, before Inst. of Automobile Engineers**

Jan. 10 .... **"Materials from the Aeronautical Point of View," by Dr. Aitchison and Mr. North before R.Ae.S.**

Jan. 24 .... **"Fabric and Dopes," by Dr. Ramsbottom, before R.Ae.S.**

Feb. 7 .... **"Airmanship at Sea," by Sqd.-Ldr. Maycock, O.B.E., R.A.F., before R.Ae.S.**

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Mar. 6 .... **"Sound Detection," by Major Tucker, before R.Ae.S.**

Mar. 20 .... **"The Report of the Aeronautical Research Committee's Panel on Scale Effect," by Capt. W. S. Farren**

EDITORIAL COMMENT.

THE paper read by Mijnheer Fokker before the Institution of Aeronautical Engineers on Friday of last week was one of more than ordinary interest, and the Institution is to be congratulated on having secured, for the first of its annual lectures by a foreign designer, such a distinguished speaker. A condensed report of the paper is published elsewhere in this issue of FLIGHT, from which it is hoped readers will be able to follow the main points touched upon by the lecturer. The first part of the paper dealt with the subject of welded steel tube construction, and the second with the development of cantilever wings.

Welded Tube Construction

On the subject of steel tube construction, Mijnheer Fokker gave a brief statement of the reasons which led him to adopt this somewhat unusual form, and it is of considerable interest to note that although so many Fokker machines were built in Germany during the War (something like 8,000), welded joints working in tension were not permitted when Fokker started work—and are not permitted now except, apparently, to Fokker, for whose benefit a special exception was made. Welding has long been distrusted in this country, and especially for joints or fittings upon which tensile stresses of any magnitude may be thrown. Thus we have here an extraordinary example of one solitary constructor who seems to have been able to make use of methods which are theoretically unsound and yet in practice have demonstrated that they are satisfactory.

The simplicity of the Fokker system of fuselage welded tube construction cannot be denied, nor can probably the advantage claimed for it of non-breaking and non-splintering on a crash. Durability and accessibility are also features of this system, and altogether the simplicity and undoubted cheapness of production make it very attractive. The question then naturally arises whether, with all these advantages admitted, and the safety and strength demonstrated over a very long period of years, the theoretical objections have been proved wrong. Frankly, we do not think they have. In spite of the

excellent record established, welding cannot be trusted, generally speaking, and we believe that Mijnheer Fokker himself admits that this is so. What he does claim, and what his lecture was calculated to show, was that the particular method of using welding adopted by Fokker gave satisfaction, and that the reason why welding has in the past met with disfavour was that it had been wrongly used. The lecturer admitted that a very great deal depended upon the designer of a machine, and that joints of the type used by him required careful planning to make them satisfactory. To us it seems that Fokker's lecture proved, not that welding may safely be adopted, but that he had succeeded in evolving methods which in practice gave reliable results. It is, therefore, very doubtful that the Fokker system will be imitated by any British aircraft constructor. In the first place, the prejudice against welding is very deeply rooted, and in any case it is almost unthinkable that the Air Ministry could be persuaded to allow its use. Nevertheless, we hope Mijnheer Fokker will not consider his paper wasted. It was certainly very far from being that, and he must have impressed many of his audience with the eminently practical way in which he had attacked a difficult problem. As Mr. W. O. Manning said, in proposing a vote of thanks, although he was perfectly certain that if any British designer took to the Air Ministry a design incorporating such construction, he would be kicked down the stairs, he was equally certain that all who had listened to the lecture would leave the hall considerably wiser than they were when they entered.

There was one feature of this portion of the lecture which did not, we think, receive the attention it merits. We are referring to the question of structure weight, and particularly to the fuselage weight. In this country, using very high-grade steels in the form of rolled, drawn or pressed sections, it has been found that something like 25 per cent. may be saved in structure weight compared with wood construction. Mijnheer Fokker, according to his own statements, uses rather inferior steels, which he has found more suitable for welding joints. It would be interesting to know how the use of such steel, which presumably must be used of a rather heavier gauge to make up for its lower ultimate strength, affects the weight of the structure, whether it comes out at about the same weight as wood construction, or heavier or lighter.

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Cantilever Wings

As the foremost exponent of cantilever wings, Mijnheer Fokker's views on this subject, given in the second part of his lecture, which was really a separate paper, are naturally of considerable interest. The main points made were that for weight and load-carrying he preferred the cantilever monoplane with three-ply covering, and for high speed the biplane with fabric covering. In the former case the ply-wood covering provided torsional stiffness, while in the biplane this was provided by the inter-plane struts. The monoplane for climbing and load-carrying, because these occurred at fairly large angles of incidence, at which the induced drag of the monoplane was smaller than that of a biplane of the same area.

One of the most interesting statements in this section of Fokker's paper was that relating to controllability, in which he stated that the Fokker machines would not stall, and could be flown at angles considerably above the stalling angle and yet remain perfectly under control. We believe that a Fokker D.VII in flying condition is available for tests in this country, and it should not be difficult to check by practical flying tests the accuracy of the lecturer's statement. Most thick wing sections exhibit a very sudden drop in lift coefficient when the angle of incidence exceeds that of maximum lift, and the absence in the Fokker D.VII of any tendency to stall suddenly must then presumably be due to the fact that the wings are graded in thickness and chord. If the tapered cantilever wing does show this absence of sudden fall in lift, then whatever its other merits this fact alone should be sufficient for its adoption to a much greater extent than hitherto. Control at high angles is admitted to be one of the most serious problems of the present time. Perhaps the test pilots at the R.A.E. may be permitted to carry out a series of tests on this subject.

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Development of High-Speed Aircraft

The paper read by Major R. H. Mayo before the Royal Aeronautical Society on November 29 gave a most excellent review of the progress that has been made in the development of high-speed flying from the earliest days up to the present time. The lecturer held up as an example of what may be achieved by judicious Government support the phenomenal strides made by the United States during the last few years, and desired to correct an impression that, he said, seemed to have got abroad to the effect that the rapid progress made by America was due to the *amount* of support given. This, Major Mayo stated, was not so. The amounts were not greatly different from those given at home, but the manner in which the available sums were allocated was different, and had resulted in the great strides made.

The small encouragement given to research in this country has been the subject of comment in these columns on very many occasions, and we are very glad to find that so eminent an authority as Major Mayo agrees with us on the subject. It is to be hoped that his frank and outspoken criticisms may result in re-considering the position of research and experiment, and that in the next Air Estimates a much larger proportion will be earmarked for this purpose.

New Member of Air Council

THE Right Hon. Sir Samuel Hoare, Bart., C.M.G., Secretary of State for Air, has appointed Air Commodore J. M. Steel, C.B., C.M.G., C.B.E., Deputy Chief of the Air Staff, to be an additional member of the Air Council.

The National Air Transport Company

JUST as we are going to press it is learned, and officially confirmed, that the agreement between the Treasury on the one hand, and the British, Foreign and Colonial Corporation, acting on behalf of the four existing air transport companies, on the other has been signed, and that therefore it is now only a question of time when the new company, formed as a result of the recommendations of the Hambling Committee, will take over the present organisations. Sir Eric Geddes is mentioned as chairman of the board of directors, and on the board will also be representatives of the four present companies. Probably these will be Lieut.-Col. Barrett-Lennard, Sir Samuel Instone, Col. Frank Searle, and Mr. Hubert Scott-Paine. Further comment must be reserved until next week.

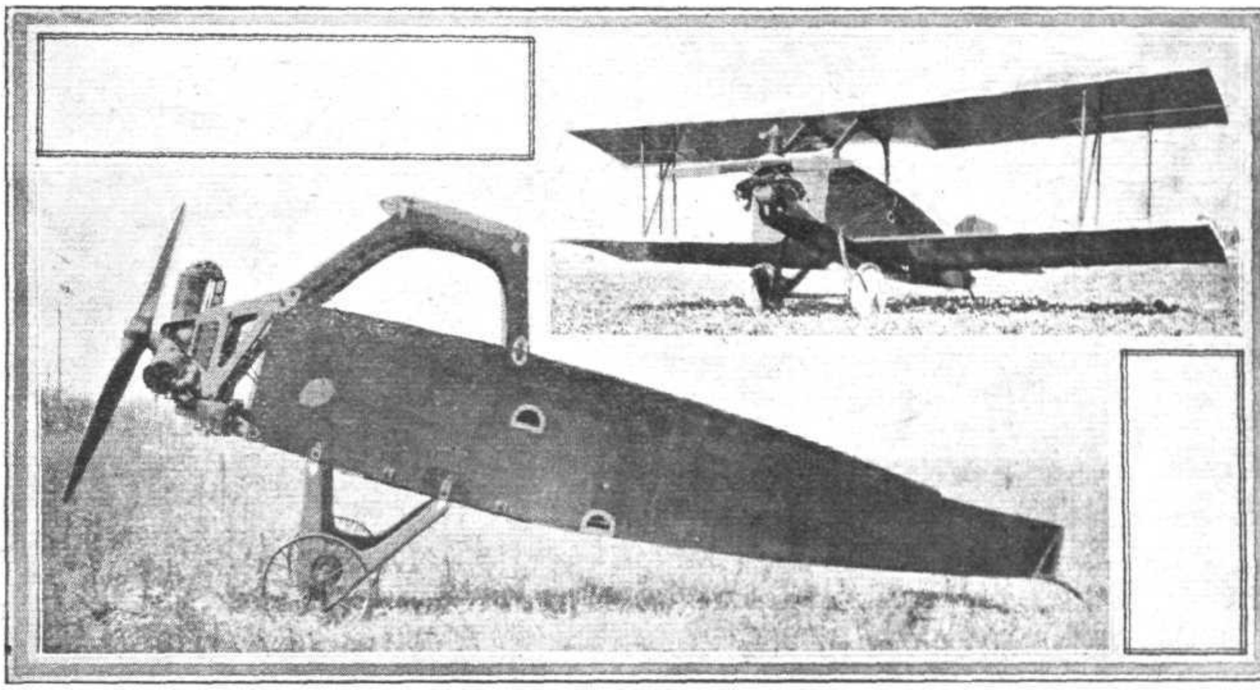
THE KINNER "AIRSTER" SPORTPLANE

WHILST the "Jennie," or Curtiss J.N. type, has given considerable satisfaction to numerous owner-pilots and aero-sportsmen in the U.S.A., there has been of late a growing demand for a more up-to-date type of machine, with improved performance, suitable for the same class of work. As may be evinced from the descriptions of such machines, built in the U.S.A., which have appeared from time to time in these pages, this demand has not remained uncatered for, and we give below—through the courtesy of our Californian contemporary *The Ace*—a brief description of another of these low-powered machines.

The machine in question is known as the Kinner "Airster," and was designed and built by the Kinner Airplane and Motor Corporation, of Glendale, Cal., who have concentrated on this type of machine since 1920. This latest model made its first public appearance at the opening of the Glendale Municipal Airport, on March 17 last, and was flown by W. B. Kinner, president of the company.

The fuselage of the "Airster" is almost entirely of wooden construction. The sides, top, and bottom are $\frac{3}{32}$-in. three-ply mahogany. Only two bulkheads are used, one fore and one aft of the cockpits. All the rest of the longitudinal and transverse bracing is accomplished with spruce members, $\frac{1}{2}$ in. by $\frac{3}{8}$ in. cross section. The cockpits are arranged in tandem, with dual control. There is ample room for the comfort of both occupants, a feature that is often more or less neglected in the smaller 'planes of this type.

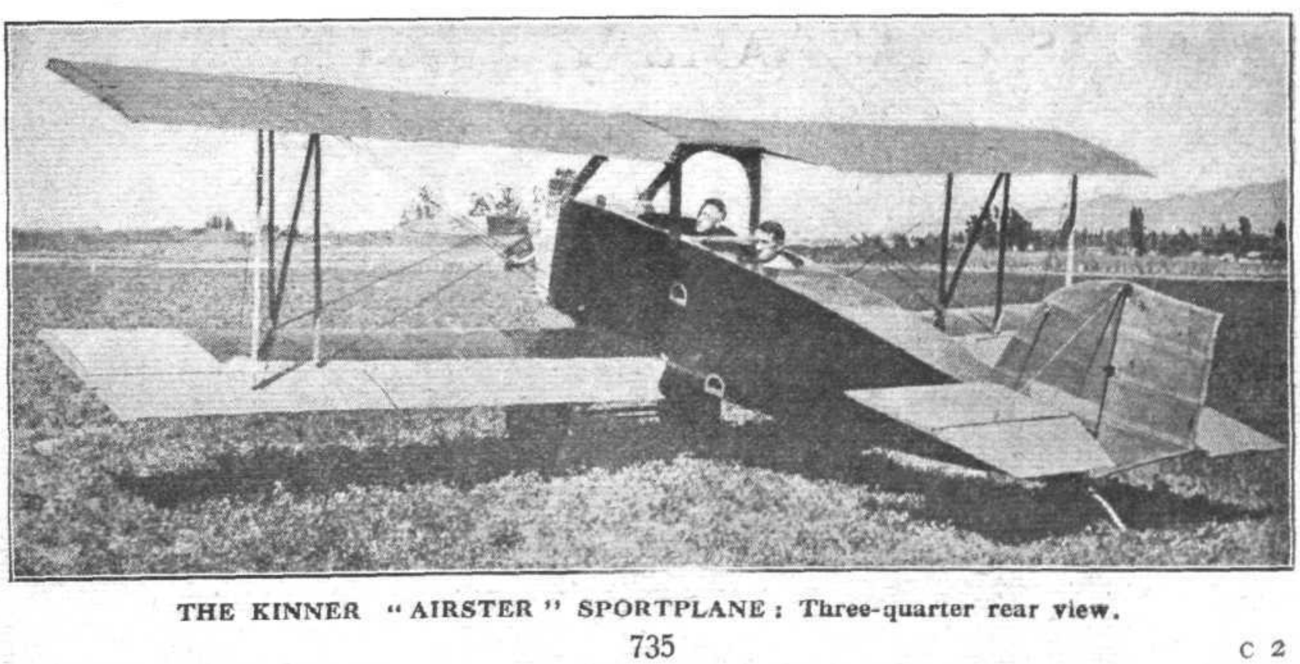
All the essential parts of the machine are very accessible, and it is possible to remove the petrol tank in 15 minutes. The centre-section struts are of the inverted U-type, built up of five-ply spruce. This type of strut gives both pilot and passenger excellent vision due to the elimination of cross wires.



THE KINNER "AIRSTER" SPORTPLANE: Two views showing, above, a three-quarter front view, and, below, the fuselage.

The wing cellule is single bay, and the interplane struts are of the N-type, of welded streamline tubing. All exposed wiring is the solid streamline pattern. The feature of interchangeability has been very well carried out in this machine. The upper and lower wings are identical, whilst all the ailerons are the same, as well as the three tail group members, the two elevators and the rudder.

The landing gear is of the conventional V-type, with each pair of struts joined through its five-ply construction. The



THE KINNER "AIRSTER" SPORTPLANE: Three-quarter rear view.

wheels are 26 ins. by 3 ins., and a spring leaf is used for the tail skid. A streamlined handle is fastened to the top of the skid to facilitate handling the tail when taking the machine in and out of the hangar. A 60 h.p. three-cylindered, air-cooled "Kinner" engine is mounted in the nose of the fuselage.

The principal characteristics of the "Airster" are:—

Span	26 ft. 3 ins.
O.A. length	19 ft. 6 ins.
Height	7 ft. 6 ins.
Gap	4 ft. 6 ins.
Chord	4 ft. 0 ins.
Stagger	9 ins.
Decalage	½°.
Dihedral	2°.
Wing area	200 sq. ft.
Wing curve	R.A.F. 6.
Weight empty	550 lbs.
Weight loaded	1,000 lbs.
Weight/h.p.	16·7 lbs.
Weight/sq. ft.	5 lbs.
Speed range	30-90 m.p.h.
Climb (ground)	1,000 ft./min.
Ceiling	13,000 ft.
Range	350 miles.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

COMMITTEE MEETING

A SPECIAL Meeting of the Committee was held on Wednesday, November 28, 1923, when there were present: Brig.-General Sir Capel Holden, K.C.B., F.R.S. (in the Chair), Group-Capt. F. W. Bowhill, C.M.G., D.S.O., R.A.F., Mr. Ernest C. Bucknall, Colonel F. Lindsay Lloyd, C.M.G., C.B.E., Capt. D. G. Murray, Lieut.-Col. M. O'Gorman, C.B., H. E. Perrin (Secretary).

The following officials at Lympne were in attendance: Major-General Sir W. S. Brancker, K.C.B., Lieut.-Col. M. O. Darby, Lieut.-Col. F. K. McClean, A.F.C., Lieut.-Col. A. Ogilvie, C.B.E.

Commander Sable, representing M. Peyret, protested that no result had been given of the last flight made by M. Maneyrol in the Altitude Competition at Lympne Motor-Glider Competitions on Saturday, October 13, 1923, and that he had been requested by M. Peyret to make a formal appeal against the award.

Lieut.-Col. A. Ogilvie, the Clerk of the Course at Lympne Motor-Glider Competitions, representing the officials, read a report outlining the method adopted in determining the height attained by competitors.

In the case of last flight by M. Maneyrol the two barographs carried by him were found to be so damaged that all efforts to calibrate them failed.

Mr. R. McKinnon Wood, the official measurer, had given a certificate to this effect.

Decision.—The Committee were of opinion that every effort had been made to arrive at the height reached by the late M. Maneyrol, but the damaged state of the two barographs had made this impossible. The certificate of the official measurer must, therefore, be accepted.

The appeal was unanimously dismissed.

RACING COMMITTEE

A MEETING of the Racing Committee was held on Friday, November 30, 1923, at which there were present: Major-General Sir W. S. Brancker, K.C.B. (in the Chair), Group-Capt. F. W. Bowhill, C.M.G., D.S.O., R.A.F., Lieut.-Col. W. A. Bristow, Capt. R. J. Goodman Crouch, Lieut.-Col. M. O. Darby, Lieut.-Col. F. K. McClean, A.F.C., Mr. W. O. Manning, Lieut.-Col. A. Ogilvie, C.B.E.

In attendance: Brig.-General R. K. Bagnall-Wild, C.M.G., C.B.E. (Air Ministry); Mr. C. R. Fairey, Capt. Acland, Mr. F. Handley Page (Society of British Aircraft Constructors); H. E. Perrin, Secretary.

Two-Seater Light Aeroplane Competition, 1924.—Letter from the Air Council outlining the suggested conditions for a Two-Seater Light Aeroplane Competition in 1924 was considered. Representatives of the Society of British Aircraft Constructors attended and submitted their suggestions to the Racing Committee.

THE SELFRIDGE 50-MILE GLIDING PRIZE

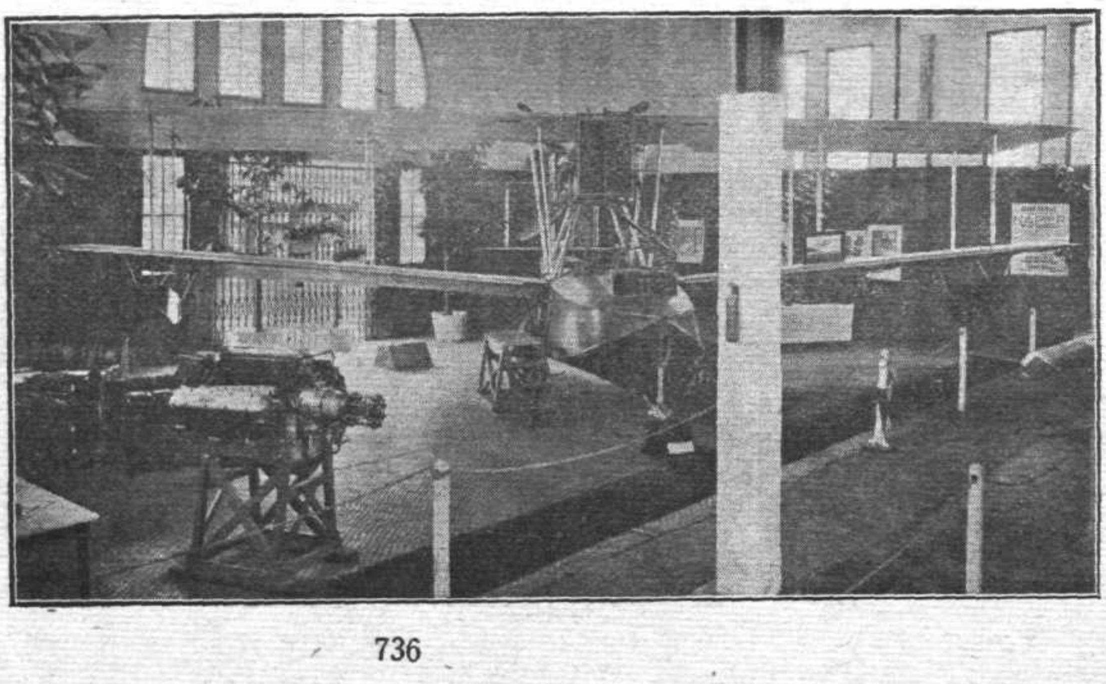
THE Royal Aero Club has received an entry from Mr. W. E. Gray of Berwick to compete for the £1,000 prize offered by Messrs. Selfridge and Co., Ltd., for a glide of 50 miles.

Mr. Gray, who did a considerable amount of flying during the War, has constructed his own glider, and proposes to make his attempt from the high slopes on the south side of the Caledonian Canal.

The competition closes on December 31, 1923.

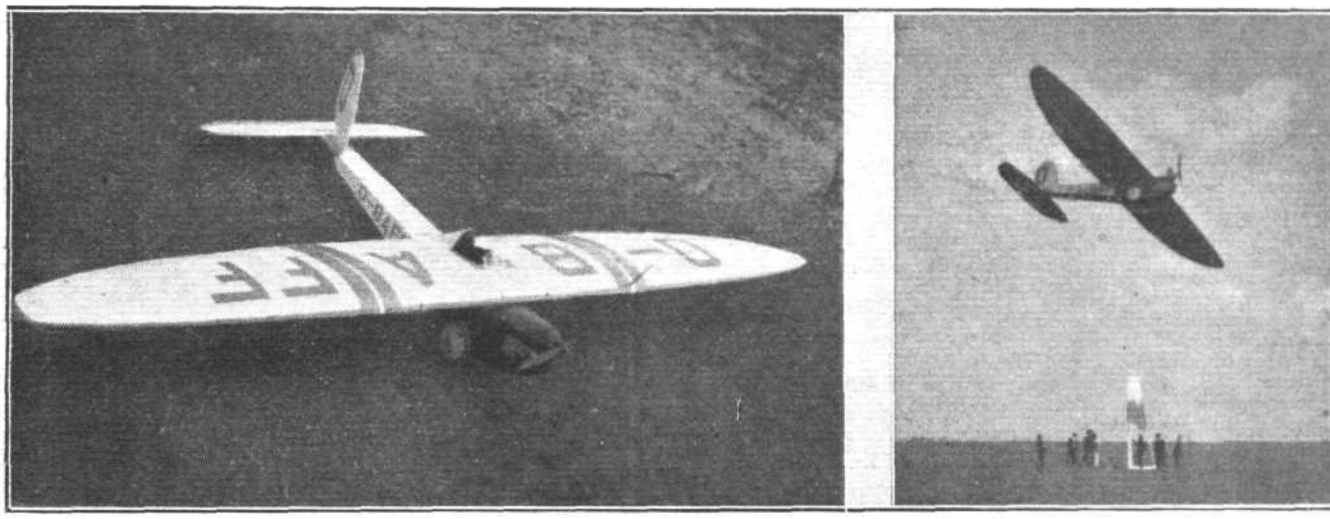
Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

Britain in the Dutch East Indies: A Vickers Viking amphibian flying-boat at the aircraft section of the Netherlands Indies Fair at Bandoeng (Java). On the same stand may be seen a Napier "Lion" engine.



LIGHT 'PLANE AND GLIDER NOTES

THE question of amateur construction of light aeroplanes, which was dealt with at considerable length in our issue of November 22, 1923, still lingers in the minds of would-be constructors, judging by the number of enquiries which we still continue to receive. Apparently, outside the circle of professional designers, the arguments brought forward against building by amateurs have not been entirely convincing, and many are still entertaining the hope that it may be found possible to popularise the light 'plane flying sport in this manner. Elsewhere in this issue we publish a letter from a correspondent, who makes the suggestion that all machines so built might be subjected to sand-loading tests of a fairly searching nature, watched over by representatives of the A.I.D. and of the firm which supplied the component parts.



BELGIAN LIGHT 'PLANES: The Jullien S.A.B.C.A. is a pure cantilever monoplane with 500 c.c. Douglas engine. On the left the machine on the ground, and on the right it is seen in flight over Evere aerodrome.

OUR correspondent expresses the view that as any breakage of the machine under sand test would mean the wasting of a very great deal of work, the amateur constructor (or, rather, amateur erector, as the work which it is contemplated the amateur should do could scarcely be termed construction) would take very possible care that the work of assembling and erecting was carefully carried out according to instructions.

* * *

THERE would appear to be a good deal to be said for this contention, and personally we feel that the time may come when some such scheme may become feasible. At present, however, most of the firms who have already entered the field of light aeroplane design and construction, or who are intending to do so, are busy on the planning of two-seater machines for next year's competitions. It is felt, also, that at present we scarcely know enough about the light aeroplane to be able to standardise with any degree of certainty that the type thus standardised is the best of which we are at present capable, while the engine problem still remains to a great extent unsolved.

* * *

FROM the Royal Aero Club we have received official notification that a competition for two-seater light aeroplanes, with engines limited to 1,100 c.c., will be held in the summer of 1924. Substantial cash prizes will, it is stated, be presented by the Air Ministry and by the Duke of Sutherland. His Grace has notified his intention of purchasing for his personal use one of the competing machines.

* * *

THE latter part of this announcement will be received with general satisfaction in aviation circles. Already the Duke of Sutherland has done a very great deal for aviation, not only by originating the idea of competitions for light aeroplanes and presenting the first prize ever to be offered for this type

The King of the Belgians Inspecting Light 'Planes: Our photograph shows, left to right, Major Smeyers, Commander of the Belgian Air Force, King Albert, Lieut. Baron Kervyn de Lettenhove, Lieut. V. Simonet, and M. Poncelet, the designer of the light 'planes that took part in the Lympne competitions.

of machine, but also in his capacity of Under-Secretary of State for Air. That His Grace proposes to give the light 'plane movement such very practical and personal support surely augurs well for the future.

* * *

IN Holland the light 'plane movement has made a start with the Carley light 'plane described in FLIGHT last week, and further progress in that quarter may be expected. In Belgium, of course, the movement started a long time ago, and already the Poncelet machines have done good work. The two machines which were at Lympne, and were piloted by Lieut. V. Simonet and Lieut. Baron Kervyn de Lettenhove respectively, did not succeed in doing very much, it is true, but both before and since the Poncelet has performed very well.

* * *

BY the way, Lieut. Simonet wishes us to remember him and Baron de Lettenhove to all the friends whom they had the opportunity to make while at Lympne, and who made their stay there so pleasant. We are sure this feeling will be reciprocated by those of our readers who had the pleasure of meeting the Belgian representatives at Lympne.

* * *

FROM a correspondent we have received the accompanying illustrations of Belgian light 'planes and of a visit paid by King Albert to the aerodrome to inspect these machines. This special royal visit took place on November 20, when the following four Belgian light 'planes were present: The Poncelet "Castar" type, familiar from Lympne; the Poncelet "Vivette," equally well known; the E.M.A. biplane, designed and built by the Military Aviation School; and the Jullien S.A.B.C.A. monoplane, built by the Société Anonyme Belge de Construction Aéronautique.

* * *

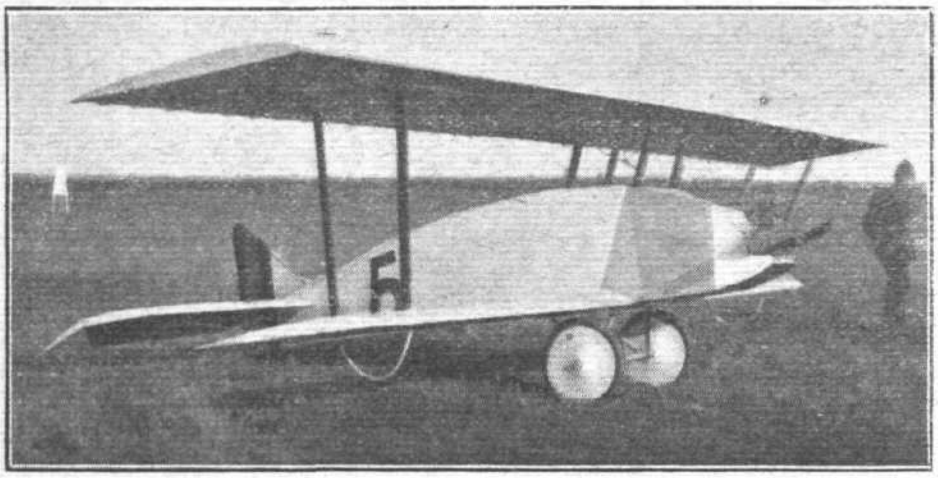
HIS MAJESTY showed great interest in the construction of the machines explained to him by the various constructors, and was much impressed by the flying qualities of the different types, especially admiring the sharply-banked turns and the good speed range.

* * *

THE Poncelet "Castar" has an area of 20 sq. m. (215 sq. ft.), and is fitted with a 16 h.p. Sergant engine. The "Vivette" has 24 sq. m. (258 sq. ft.) of surface, and is also driven by a Sergant. The E.M.A. biplane, of 20 sq. m., has an 1,100 c.c. Anzani engine (two-cylinder flat twin); while the Jullien S.A.B.C.A. is variously fitted with a three-cylinder Salmson radial of 998 c.c. and a Douglas flat twin of 500 c.c.

* * *

As the accompanying photographs will indicate, the Jullien S.A.B.C.A. monoplane is of very pleasing lines, with its elliptical plan form wing of the pure cantilever type. The Douglas engine is neatly cowled in, with only the cylinder heads projecting. The chain transmission to a propeller placed high is entirely enclosed in the nose of the fuselage. The pilot's cockpit is in the centre of the wing, and it would seem that the view cannot be very good, especially for taking off and landing.



Belgian Light 'Planes: The E.M.A. biplane is fitted with an 1,100 c.c. Anzani engine. This machine has reached an altitude of 4,000 ft.

* * *

THE E.M.A. biplane built by the Military Aviation School has a fuselage of rather curious shape, resembling an aerofoil section. We understand, however, that a modification to this has been made since the photograph was taken, and has resulted in considerable improvement.

* * *

THE Poncelet "Vivette" has been slightly modified, and on November 26 Lieut. Simonet made several flights with a passenger, the machine taking off quite normally. One flight with two up lasted 10 minutes. Probably this is a record for an engine of this capacity.

* * *

AT the forthcoming Brussels Motor Show there will be an aeronautical section, and we learn that the Military Aviation section, the S.A.B.C.A., and the Stampe Flying School are exhibiting, and it is stated that there will be a Poncelet, a Jullien, and a D.H.53 light 'plane at the show.

R.A.F. MEMORIAL FUND

A MEETING of the Executive Committee of the Fund was held at Iddesleigh House on November 20, the following being present: Lord Hugh Cecil (Chairman), Dame Helen Gwynne-Vaughan, Mrs. Barrington-Kennett, Mrs. L. M. K. Pratt-Barlow, Sir Charles McLeod, Air Vice-Marshal J. F. A. Higgins, Air Vice-Marshal Sir Geoffrey Salmond, Air Vice-Marshal Sir Vyell Vyvyan, Air Commodore C. A. H. Longcroft, Air Commodore E. R. Ludlow-Hewitt, Lieut.-Commander H. E. Perrin.

The amount of grants (£432 5*s.* 2*d.*) sanctioned by the Committee since the previous meeting was approved. The Chairman of the Grants Sub-Committee stated that the number of cases his Sub-Committee had dealt with since October 17 was 47, and that the Secretary had, in the same time, dealt with 27 in which he had sanctioned grants.

A letter was read to the Committee from Messrs. Lloyds Bank, Ltd. (Cox and Co.), stating they were making an annual subscription to the Fund of £50, commencing with January 1 next, this sum to be expended at the discretion of the Grants Sub-Committee in relieving cases of distress amongst officers past and present, or their dependents.

The Honorary Treasurer announced that the Fund had received, through the kindness and generosity of the Air Council, the net profits of the Aerial Pageant at Hendon in June.

In view of the increased assistance which has been given to the Fund during the present year, the Committee came to the decision that grants in aid of distress and for educational purposes, and so forth, should be considerably increased in the immediate future, it being held that it is better to spend more freely now in times of distress than to accumulate capital.

It was noted formally that Air Chief-Marshal Sir Hugh Trenchard had laid a wreath at the foot of the R.A.F. War Memorial on Armistice Day.

Air Commodore A. E. Borton, C.B., A.O.C., R.A.F. Cadet College, Cranwell, was unanimously elected a member of the Executive Committee; and the resignation of his membership by Sir Maurice Bonham-Carter was accepted with regret.

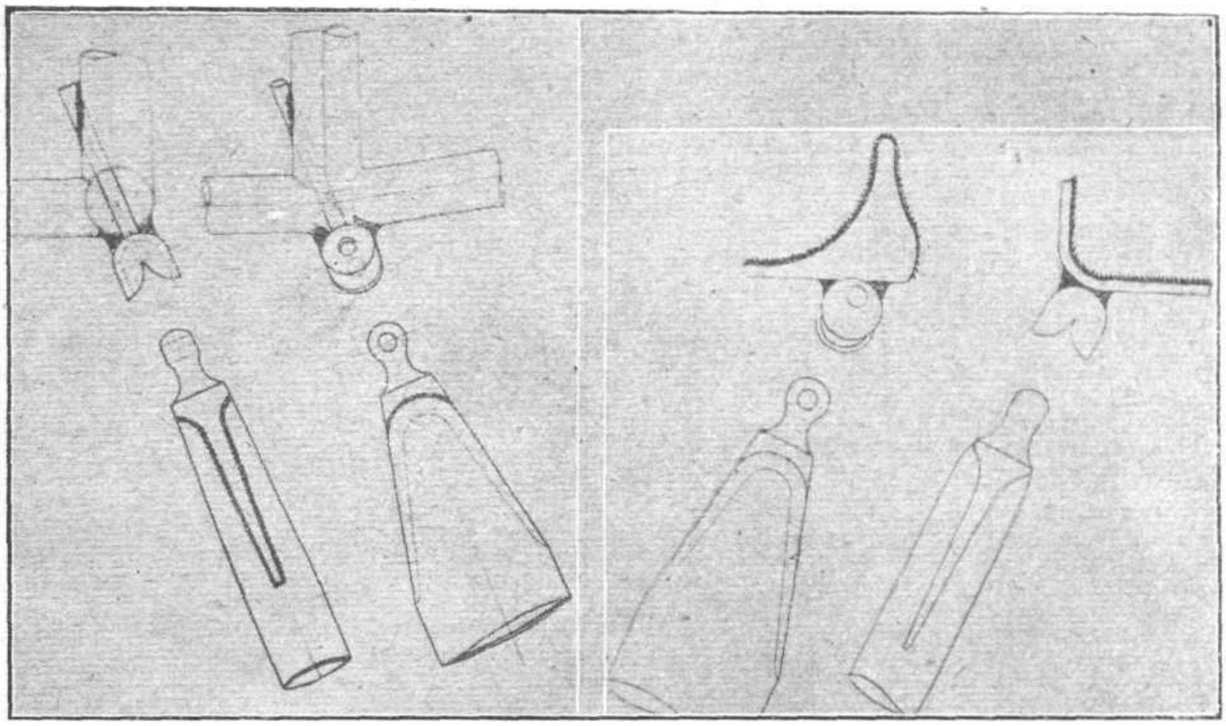
The Committee had laid before them correspondence received from the Air Ministry concerning an offer made by the Commissioners of the Queen Victoria School, Dunblane, to the Air Council, proposing to include in the scheme the sons of Scotsmen *serving* or *who have served* with the Royal Air Force, and the Committee unanimously recommended that the Air Council should avail themselves of this kind offer.

TWELVE YEARS' WELDED STEEL TUBE CONSTRUCTION

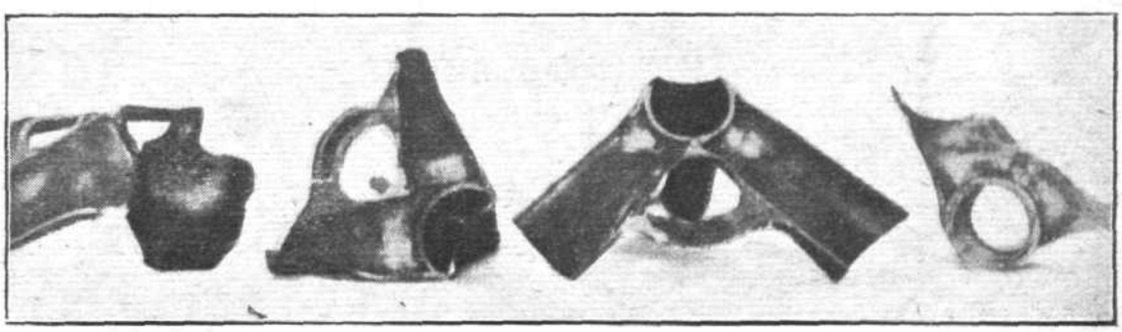
THE Institution of Aeronautical Engineers is to be congratulated upon having secured, for their meeting on November 30, so distinguished a lecturer as Mijnheer Fokker, the famous Dutch aircraft designer. The Fokker machines, and Fokker methods of construction, are not unfamiliar to readers of FLIGHT, but the fundamental reasons for the adoption of these methods have not always been easy to ascertain. On Friday last the originator—and up to the present probably the sole exponent—of these methods of construction gave his personal views on the matter to a large audience at the Royal Society of Arts. Mr. W. O. Manning was in the chair, and before calling on Mijnheer Fokker to read his paper, the Chairman read a letter from the President of the I.Ae.E., Lieut.-Col. Moore-Brabazon, regretting that owing to his engagements in connection with the forthcoming general election he was unable to be present. Mijnheer Fokker then read his paper.

The paper proved a very long one, and was really two separate papers, as indicated by the title. The first dealt with the lecturer's twelve years' experience of welded steel tube construction, and the second with the development of cantilever wings. It is, unfortunately, quite impossible for us to give the two papers *in extenso*, but it is hoped that in the following summary no point of vital importance has been omitted. From the great number of slides shown we have chosen a few showing the special Fokker methods of construction, so as to illustrate the main principles involved, while one or two of the photographs show interesting types of Fokker machines. However much the various types of Fokker land 'planes may differ in other respects, they all have this in common: that they have all-steel fuselages and all-wood wings.

A few brief notes on the lecturer's early history and difficulties preceded the technical part of the lecture. When Mijnheer Fokker informed his paternal parent that he wanted to take up aviation, he was informed that there must be something wrong with him somewhere, and that no money would be forthcoming if it was intended to be spent on the purchase of an aeroplane. (It will be seen that in this respect Fokker's early experience was very similar to that of early English experimenters in aviation.) As young Fokker had quite made up his mind, he made his first experiments with models, and as there was at that time no opportunity to study aeronautics in Holland he had to go abroad. Chance took him to Germany, where he joined a technical school at which aeroplane construction was taught in theory and practice. He soon found, however, that his previous model tests had taught him more than his teachers could at that time, and when the professor of the school was found amid the wreckage of the school machine after his maiden voyage the school went bankrupt. There was then nothing to be done but to build a machine himself, and this Fokker did, choosing the simplest design, so as to make the construction as cheap as possible. On this machine he soon taught himself to fly. Fokker's model experiments had shown him that lateral stability could be obtained by a suitable combination of dihedral angle, back-swept wings, and a high position of the centre of gravity, and all his early machines possessed these features. In this connection it is of interest to note that some recent Fokker flying boats having back-swept wings proved as stable as did the early machines. It may be mentioned that the earliest Fokker machines had no ailerons, as it was found quite possible to fly them without any lateral control.



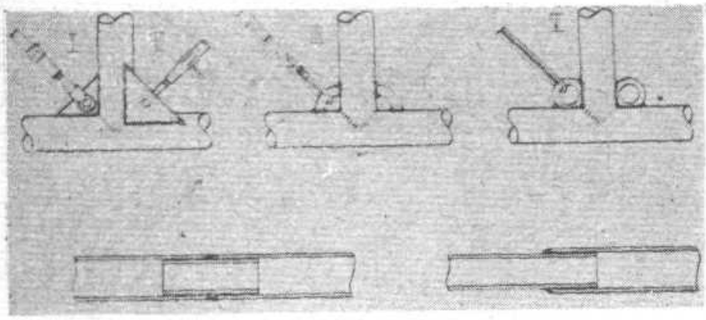
Fokker tubular construction: Two methods of distributing the local stress of a strut over a large area.



Fokker construction: Sectioned joints, etc., of a fuselage.

In 1911 Fokker built his first all-steel fuselage, and it is worthy of note that in principle nothing in the Fokker construction has been changed since. Fundamentally, the Fokker form of construction consists in using steel tube longerons to which are welded the vertical and horizontal struts. This form of construction, the lecturer stated, had several advantages. For instance, no wood-working machinery was needed, and no fittings nor wiring plates were used, and difficult joints made easy. In the early stages of the evolution of this form of construction several difficulties presented

themselves. One of these problems was that of attaching the bracing wires. Several solutions were experimented with, some of which are shown in the accompanying diagrams. A steel plate may be let into the angle between the tubes and welded in place, thus allowing the fork-end of the strainer to be attached by a simple bolt. Another way shown is to weld

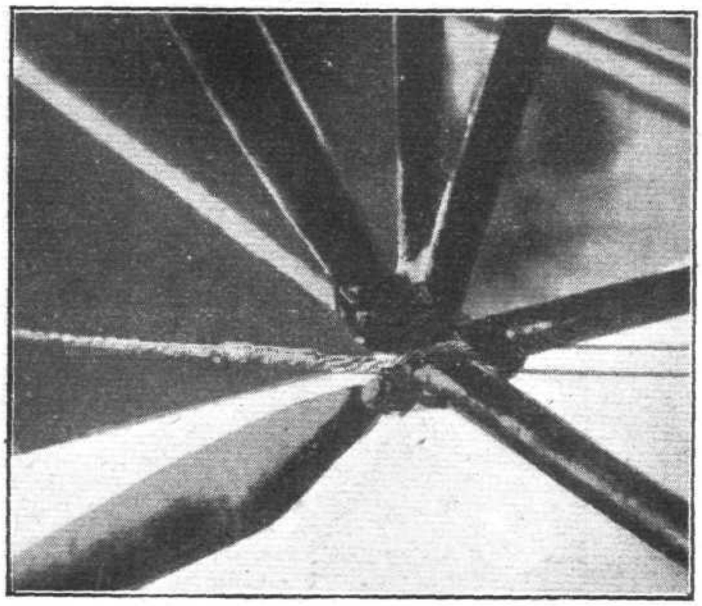


FOKKER CONSTRUCTION: Various forms of terminal attachments for fuselage bracing wires, and, below, joining by welding two tubes of the same diameter and of different diameters.

two steel plates on the outside of the tubes so as to accommodate the strainer between them. A third way is to weld a small quadrant or sector of thick-walled steel tube into the angle, so that the bracing wire may be passed through it. This, the lecturer stated, was the form adopted as standard on all Fokker machines at present, and the diagonal bracing was in the form of a double wire drawn through the quadrant in the corner and tightened with one strainer only. At first very high tensile strength wire was used, but it was found difficult to handle this wire, which was very sensitive to the manner in which the loops at the ends of the wire were made. Once or twice wires that had a factor of safety of 25 broke during ordinary flight, showing that the wire had been misused during the rigging of the machine, and later a more flexible wire, with a lower ultimate tensile strength, was used, which was found satisfactory. Instead of the tubular quadrant a complete solid ring might be used, which, the lecturer stated, had the advantage of strengthening the lower part of the compression struts.

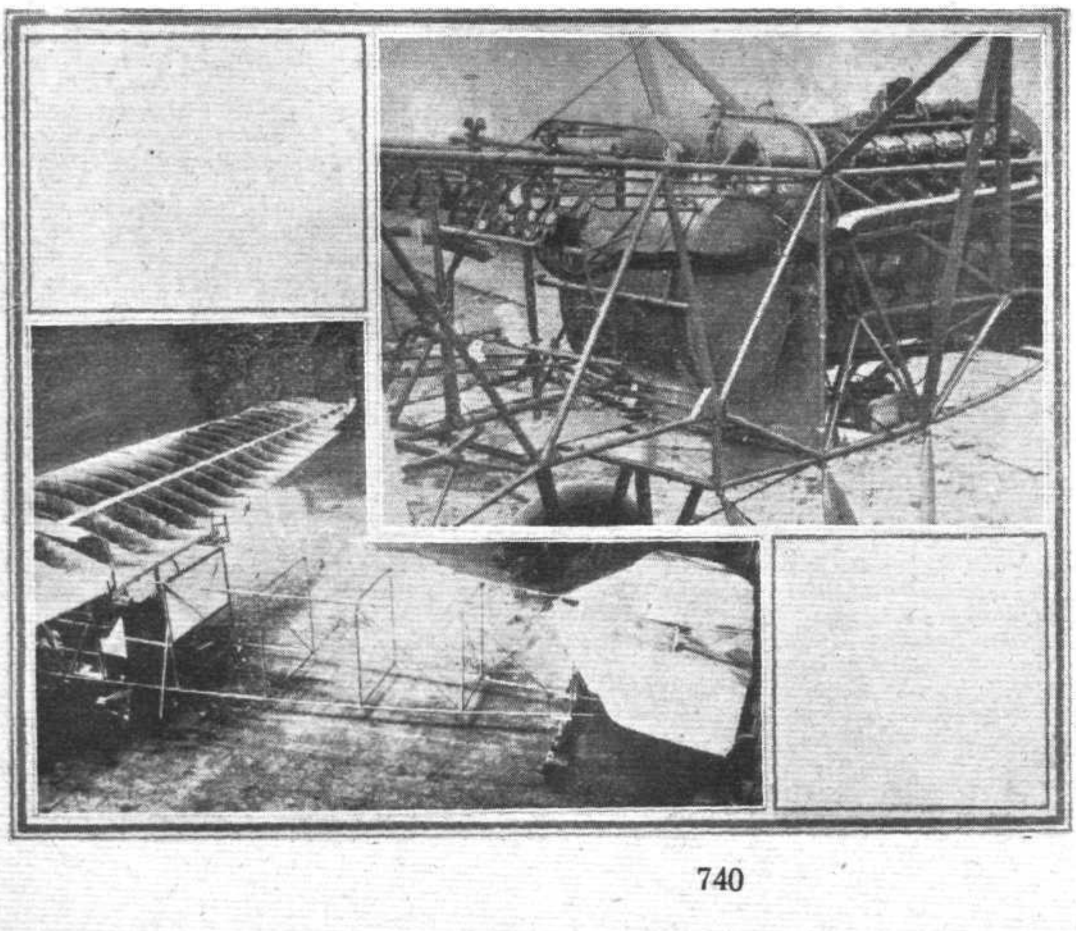
On the subject of joining two tubes of different diameters together the lecturer stated that this was very simply done, as shown in one of the diagrams, by inserting the end of the smaller tube into the larger one and welding the outer seam. To join two tubes of the same diameter a small length of tube of smaller diameter was inserted in the ends of the larger and the whole welded along the seam. In the case of tubes working in tension, the butt joint of the outer tubes was made perpendicular to the axis of the tubes, while for compression struts such a joint was made with the joint at an angle, the reason being that it had been found that compression struts were in a better condition when the annealed area was not at right angles to the axis. Failures, the lecturer said, never occurred in the joint itself, but in the material adjoining the weld, where the material had been annealed by the heat action of the acetylene flame.

Referring to the problem of transferring high local stresses at right angles or nearly so to the walls of tubes, such as occur at the point of attachment of the undercarriage struts, Mijnheer Fokker indicated two methods of doing this. In one, shown in one of the diagrams, the cup of the ball-and-



FOKKER CONSTRUCTION: A typical junction of seven different struts and one bracing cable.

socket joint has a long stalk which passes through the longeron tube and diagonally through the compression strut, being welded to both as indicated. The second form, also illustrated, of strengthening a corner fitting consists in welding a strong plate on to it to avoid buckling.



Fokker Construction: The upper photograph shows the form of construction employed in the front portion of the fuselage, while in the lower illustration may be seen both the general fuselage construction and the all-wood wing before covering

The principal secret of welded steel tube construction was indicated by the lecturer as depending upon the gradual transmission of forces from one tube to the other or to a fitting, and upon the avoidance of all sharp transitions. The material employed was another important factor, and the lecturer quoted from the McCook Field report on tests with the Fokker D.VII, which stated that "Good weldable steel conforms almost to steel specification 1 02 0, containing 0·15 to 0·35 per cent. carbon, 0·3 to 0·4 per cent. manganese, 0·045 per cent. phosphorus, and about 0·1 per cent. sulphur." He thought the strong dislike of welding in England and France must be attributed to the use of unsuitable materials, and stated that the steels called for in the English specification were unsuitable for his form of construction.

With regard to the difficulty of welding, the lecturer's experience had been that during the War more than 80 per cent. of the personnel employed were women, who very quickly learned the work. Slides were shown of good welds and bad welds, and it was stated that a good guide to the quality of welded work was formed by the speed at which the work was done. Quick welding was good welding, while slow welding was bad because it implied either burning or irregular work. Over-speeding was impossible, as it showed immediately in the appearance of the weld in the form of irregularities and openings. The rectangular portion of a fuselage was very easy to weld. Greater skill was required in the forward part, where the structure was triangulated as shown in the illustrations. Consequently this part of the work was done by the more skilled workmen. The procedure was outlined by the lecturer as follows: On large tables on which the shapes of the sides of the fuselage have been drawn out, the tubes are cut to length and put together temporarily, and are held in position between angle irons. They are then point-welded together and the fuselage sides are removed and the joints finished off. The cross tubes are next welded in place and the small quadrants in the corners are inserted. The fuselage is then placed in a rigging jig, the double wires put in and tightened up, and the fuselage structure is complete.

An advantage claimed by Mijnheer Fokker for his form of construction is that the design may be changed easily at any time as regards dimensions. Also he claims the construction is easy to inspect, as after removing the fabric every joint is visible from all sides, as there are no fittings to be removed.

The lecturer pointed out, in proof of the satisfactory behaviour of his particular form of welded tube construction, that over 10,000 aeroplanes had been built and not one accident had happened which could be ascribed to the welding failing. Cracks in the tubes had been observed, but these developed gradually and not suddenly, and in every case it was proved that the damaged parts had, for some reason or other, been subject to higher local stress than the normal for which the structure had been calculated. As an interesting fact he mentioned that if a break in the structure occurred it was always found that it was never the welded joint itself that failed, but invariably at a point in the tube itself about ¼ or ½ in. from the weld.

A further advantage of the welded tube fuselage upon which the lecturer laid stress was that in the case of crashes the shock was broken gradually by the steel tubes bending. The structure kept together without splintering, the tubes bending but holding together to the last. In connection with one of the slides showing the nose of a commercial machine crashed in a night landing, the lecturer pointed out that, apart from the advantage of safety to crew and passengers, the Fokker type of fuselage was never actually written off, as repairs could be very easily made, even in the field.

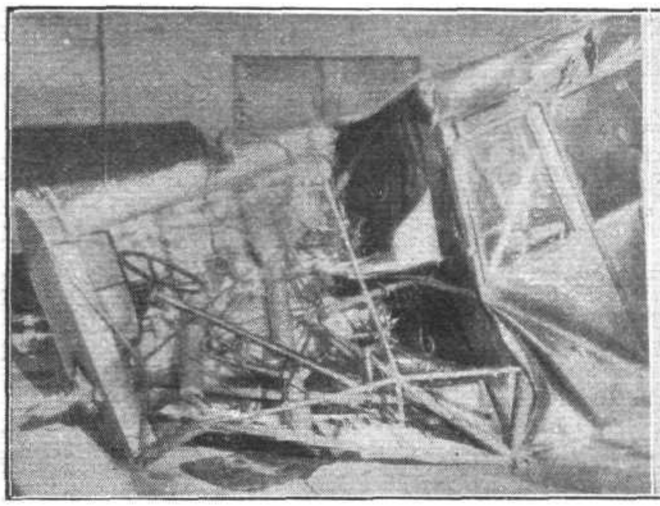
In concluding this section of his paper Mijnheer Fokker pleaded that it did appear to him that when it had been found that in twelve years no accident had occurred which could be blamed on the construction, then the objections to it could be considered to be of a theoretical nature only, and he concluded, amid loud applause, by quoting the old English adage: "The proof of the pudding is in the eating."

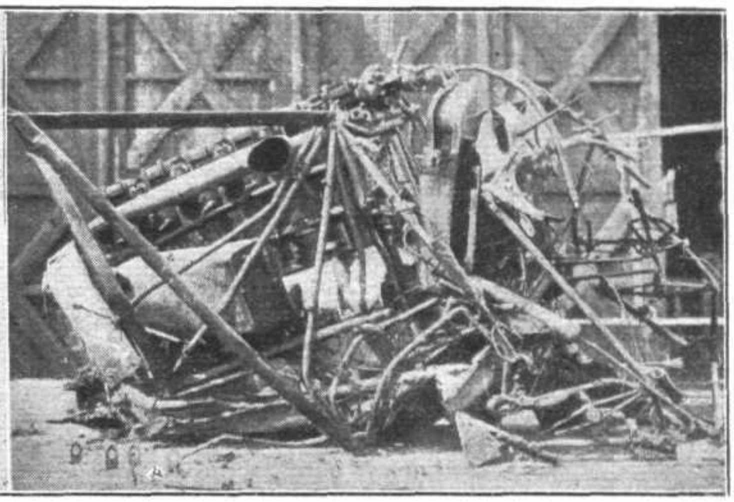
Cantilever Wings

The second part of Mijnheer Fokker's lecture dealt with the development of cantilever wings. The lecturer pointed out that this form of wing was not new in aviation, and that all he had done was to develop the type by making use of new methods of construction. As in the case of the all-steel fuselage, his main principle had been that of simplicity. Many materials were tried and many forms of construction experimented with, but in the end the advantages of the all-wood wing far outweighed any qualities that steel or duralumin might appear to have. The lecturer pointed out that the main difficulty with cantilever wings was to make them strong in torsion. For this reason he adopted the ply-wood covering for monoplanes and fabric covering usually for biplanes, as in the latter case the use of inter-plane struts gave the required resistance to torsion. Fokker advocated the biplane where speed was desired and the monoplane for climb and load-carrying, the reasons given being that for climbing and also for carrying heavy loads flying is done at a fairly large angle of incidence, at which the induced drag of the monoplane was considerably smaller than that of the biplane.

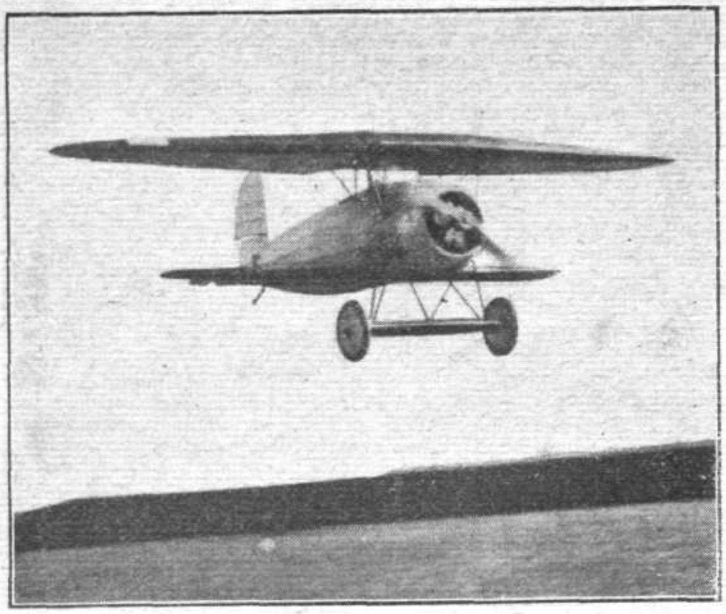
A comparison of the weights per square foot between a fabric and ply-wood covered wing showed that there was practically nothing to choose, the reason being that the weight of the drag bracing and fittings (which are entirely absent in the monoplane) was approximately the same as the difference in weight between fabric and ply-wood covering. On the question of aerodynamic efficiency the lecturer stated that, whereas the best L/D ratio of the average biplane was 8·3 to 1, that of the Fokker monoplanes was 10·2 to 1. In addition to the general cleanness of the cantilever wing there was the advantage that there were no wires and fittings to be made, and erecting and rigging were enormously simplified. Also the cantilever wing kept its shape much better under changing climatic conditions.

The use of cantilever wings necessitated deep wing sections, and although he personally had always been a believer in the efficiency of this type of aerofoil, he met with strong opposition, not only from the German scientists but also from pilots, the former objecting on the score of aerodynamic efficiency, and the latter because they could not conceive that a wing devoid of external bracing could be strong enough. Even sand-loading tests did not convince the pilots, and it was not, the lecturer said, until he travelled along the front from squadron





FOKKER CONSTRUCTION: On the left, the nose of a machine damaged in a night landing. The pilot was unhurt. On the right, the front portion of a machine crashed while trick-flying close to the ground. Although battered and bent, the framework held together, and the occupants were not seriously injured.



A FOKKER MACHINE OF 1915 : This little biplane, with rotary engine, was the first cantilever machine, and Fokker had great difficulty in convincing the German authorities that this form of wing could be strong enough.

to squadron, demonstrating the wing strength by placing about 20 men along the wings, that he could convince them that the cantilever wing was sufficiently strong. Mijnheer Fokker then briefly outlined the Fokker "Milestones," beginning with the little Fokker triplane which marked the real beginning of the practical adoption of cantilever wings, and finishing with the latest Fokker, fitted with a Napier "Lion" engine, a photograph of which is given herewith. We cannot devote the space to give a reference to the various types in detail, and as most of them will be familiar to readers of FLIGHT, we will turn to some interesting remarks made by Mijnheer Fokker on wing flutter and on controllability of cantilever wing machines.

The use of cantilever wings had, he said, given rise lately to a strange phenomenon, since in fact speeds of 150 m.p.h. or more had been attained. In Holland the new phenomenon —wing fluttering—was first observed on a monoplane with semi-cantilever wing, belonging to the Royal Dutch Navy, which vibrated at large angles of attack. The same thing was noticed on two occasions by the chief of the Fokker scientific department. The remedy was found to be to bring the centre of gravity of the ailerons to coincide with the hinge, when no further trouble was experienced.

On the important question of control at angles beyond the stalling angle of a machine, Mijnheer Fokker made some interesting statements. He had, he said, been somewhat astonished at the importance attached to this subject in England. On the Fokker D.VII, he stated, it was quite possible to fly this machine with the engine on or off and with the control stick pulled right back. The machine remained perfectly controllable on rudder, elevator, and ailerons. When it was desired to climb the stick had to be pushed forward, showing that the previous form of flying had entailed a reversal of controls, flight taking place in the second region. With the engine off and the stick pulled right back the machine would glide down at a very steep angle. The vertical velocity had been ascertained to be 12 to 14 ft./sec., while the horizontal speed was only 60 ft./sec., giving a gliding angle of 4·5 to 1, or 12° to 14°. The best gliding angle of the Fokker D.VII was 8·3 to 1. It was even possible to land the machine in this way, although, naturally, somewhat severe stresses were thrown on wheels and axle. The machine had no tendency to roll over sideways, and the rudder control was so great that the machine could be swung about by kicking the rudder from side to side without throwing the machine into a stall or spin. The machine could be spun, but required full elevator and bottom rudder. As soon as the rudder was released the D.VII stopped spinning. These qualities were found in all Fokker machines, which made them almost "fool-proof," and were indirectly a result of cantilever wings or, anyway, of thick wing sections.

The latest Fokker: This one-and-a-half 'plane is fitted with a Napier "Lion" engine, and has reached an altitude of 8,500 metres with a load of 1,000 lbs. Mijnheer Fokker claims that it is not essentially different in principle from the 1915 machine.

A brief discussion followed the lecture, which did not, however, bring to light any new points. The Chairman, Mr. W. O. Manning, then proposed a very hearty vote of thanks, which was both loud and prolonged.

"Air Strategy"

THE paper under this title, which was at first announced as to be read by Wing Commander Edmonds before the Royal Aeronautical Society on December 13, will be read before the Royal United Service Institution, by arrangement with the Royal Aeronautical Society, on December 12, 1923, at 3.30 p.m.

13 Entries for French Engine Competition

FROM Paris it is announced that 13 engines have been entered for the French competitions next year. These are 2 Renault, 1 Salmson, 2 Breguet, 2 Lorraine-Dietrich, 1 Peugeot, 1 Panhard-Levassor, 2 Hispano-Suiza, and 2 Fiat. No British engine has been entered.

All About the "Bristol" Gas Starter

AN artistically produced little pamphlet has just come to hand from the Bristol Aeroplane Company, of Filton, Bristol, in which is presented a very complete description of the "Bristol" gas starter for high-powered engines. Photographic illustrations and diagrams assist in the explanation of the working and construction of this wonderfully successful and useful aircraft unit, which was fully described in FLIGHT for December 1, 1921.

THE DEVELOPMENT OF HIGH-SPEED AIRCRAFT

BY MAJOR R. H. MAYO

THE paper under the above title, read by Major Mayo on November 29 before the Royal Aeronautical Society, proved uncommonly interesting, and perhaps to a certain extent controversial. It is regretted that considerations of space prevent us from publishing the paper in full, and we can but give a brief summary of the more important points made by the lecturer.

The first part of the paper was devoted to an historical review of the progress of high-speed flying, starting with what may be termed the first landmark, viz.: the establishment of the International Gordon-Bennett Race in 1909, when the first winner was Glenn Curtiss, whose latest machines now hold the world's speed records. Tracing the development through the various types from the 1909 Gordon-Bennett Curtiss pusher, with a speed of 47 miles per hour, the 70 h.p. Blériot of 1910, the Nieuport monoplane of 1911, the Deperdussin of 1912, and the Deperdussin of 1913, the lecturer showed how curves of speed followed very closely the curve of horse-power, indicating that by far the greatest factor in the increase in speed was due to the increased power of the engines available, although considerable improvement was also effected in the aerodynamic efficiency of the machines.

Major Mayo called attention to the fact that, apart from Curtiss' success in the Gordon-Bennett of 1909, the evolution of the high-speed machine was entirely in the hands of the French until 1913. After the Gordon-Bennett Race of 1909 France won every international speed event of importance till 1914, and during this period the essential evolution of the modern type from the American type took place.

The lecturer then turned to the history of British aviation, showing how the tractor type of machine found early favour, first being employed by Mr. A. V. Roe in his very early experiments, and gradually becoming the only type to be considered for high-speed work. We have not the space to follow the lecturer step by step through that early British history, interesting though it be, and probably to the majority of readers of FLIGHT it will suffice if we mention merely the names or type letters of the different steps in the evolution of British high-speed aircraft. Beginning with Roe's machine of about 1909 or 1910, these types were indicated by the lecturer to be somewhat as follows: De Havilland's B.E.2 (1912), the Royal Aircraft Factory B.S.1 (1913), the S.E.2 and Sopwith Tabloid (1913), the Bristol Scout (1914), and the S.E.4 (1914).

The British Research Period

Continuing, the lecturer said: "I have given an indication of the remarkable progress in British high-speed design during the years 1911-14. The development in this direction is illustrative of the general progress made during this remarkable period. The evolution of the inherently stable aeroplane is another example of what was being achieved. What was the reason for these rapid and immensely important strides? It was that as a nation we were applying ourselves with extraordinary vigour to aerodynamical research, not only on the full scale but in the laboratory."

Turning to the War period, the lecturer again referred briefly to the various types which marked the evolution of high performance machines, beginning with the Bristol "Scout" and following development step by step through the D.H.2, the F.E.8, the Sopwith "Pup," the D.H.5, and the Sopwith "Camel." This brought the history to 1916, when, the lecturer stated, a solitary monoplane appeared, the Bristol, with 110 Le Rhone engine. This machine had a remarkable speed of 127 miles per hour at 6,500 ft., which was a long way ahead of that of any other military machine up to that date. In spite of its fine performance the machine was not considered suitable for work in France, and was only used for service in the East. This was the only British monoplane produced during the War. Continuing his review of progress, Major Mayo referred to the Sopwith triplane of 1916, and to the Fokker machine of the same period. Concerning the latter the lecturer stated that, contrary to general opinion, the Fokker was not a fast machine. It had, he stated, a fairly good climb, but its great feature was its synchronised machine-gun firing through the propeller.

In 1916 the whole situation in regard to speed machines began to change, owing to the production of new and more powerful engines. The more powerful British engines were generally applied to the larger types of machine, and it was not until supplies of the French Hispano-Suiza engine were available that the water-cooled engine was seriously applied to the single-seater scout machine. When this engine became available such machines as the French "Spad" and the British S.E.5 were produced. The S.E.5 was followed by the Sopwith "Dolphin," which had certain military advantages, although its speed was approximately the same as that of the S.E.5.

Then came the Martinsyde F.3, with Rolls-Royce "Falcon," and, finally, the Martinsyde F.4, with 300 Hispano-Suiza engine. Concerning the latter machine the lecturer said: "The Martinsyde F.4 was the fastest machine produced in this country, and, I think, in any country, during the War. Its speed was officially recorded as 144·5 miles per hour at 6,500 ft., which would mean, say, 147 at ground level. Its landing speed was about 45 miles per hour. The secret of this machine's good performance was its light loading per horse-power, achieved by excellence of general structural and detail design, and its maximum speed was more than three times its minimum speed, which is a very good figure, taking into consideration that it was designed as a military machine and not merely as a racer. I take the Martinsyde F.4 as representing the highest standard of design of a high-speed machine achieved during the War."

Major Mayo then briefly referred to the revival of the rotary engine in 1918 with the advent of the 230 h.p. B.R.2 engine fitted to the Sopwith "Snipe," which, he said, was a machine of great military value, and was still one of the standard machines with which our Air Force was equipped. He thought that a rotary engine of 200 h.p. or more did not pay, and that it was unlikely that a rotary engine would ever again figure in the fight for high-speed honours. The lecturer then referred to the development of the radial air-cooled engine of high power, first the 340 h.p. A.B.C. "Dragonfly," and after the War the Bristol "Jupiter" and Armstrong-Siddeley "Jaguar" engines.

In reviewing the War period development, the lecturer drew attention to the surprisingly small progress made during the War in regard to speed. He thought it remarkable that the maximum speed attained should have been less than 20 m.p.h. above the pre-War standard. Even making full allowance for the ever-increasing weight of military equipment, he thought it must be admitted that the progress made was not in proportion to the immense amount of designing effort put in. The reason for this, the lecturer thought, was that the War was not a period of research, but a period of application of previously acquired knowledge.

The Post-War Period

The post-War period, Major Mayo said, was a depressing one from the British point of view, for whereas in 1918 we could justly claim to be ahead of any other nation in aeroplane design, we certainly could not make any such claims today. The lecturer referred in considerable detail to the development of the high-speed machine after the War, beginning with the Gordon-Bennett Race of 1920, which was won by a French Nieuport biplane, with 300 Hispano-Suiza engine, at a speed of 169 m.p.h. It was, the lecturer stated, in 1920 that America first loomed up as a potential power in the struggle for aerial honours. The American team in that race suffered from various troubles, such as engine failure, and did not do itself justice, but the careful and advanced design was sufficient to indicate that America's great aerial effort, started in 1917, was already bearing fruit. On the subject of America's post-War achievements, Major Mayo said that these were an index of her progress in all branches of aeronautical science, and this progress had, he stated, been due to a proper appreciation of the relative importance of research and experiment, and not, as was sometimes supposed, to the expenditure of vast sums on her air services generally.

Continuing his reference to the American types which have helped to build up America's present position in aviation, the lecturer referred to the Verville Packard machine, which, although unsuccessful in the Gordon-Bennett of 1920, won the first international race for the Pulitzer Trophy a few weeks later.

In France the winning of the Gordon-Bennett Race by a Nieuport in 1920 won that cup outright for France, but a new international speed race for the Deutsch Cup was immediately established, and the contest for this was held in 1921. Throughout that year and the succeeding year there was the keenest rivalry between various French firms to establish new world's speed records over the kilometre course. The record went up by small advances to 194 m.p.h. at the end of 1920, and then to 205 m.p.h. in the autumn of 1921. The successive small advances were achieved mainly by boosting up the power of the 300 Hispano, but the big jump to 205 m.p.h. was due to

the introduction of the new type Nieuport, the "Sesquiplan." This machine won the Deutsch Cup Race in 1921 at 175 m.p.h. and the lecturer stated that the same type of machine would have won the Deutsch Cup of 1922 but for engine trouble, as in the only completed lap Sadi Lecointe raised the record for 100 kilometres to 202 m.p.h. In the meantime America had been making steady progress, the American Government appreciating the value of racing as a means of developing high-speed qualities. The Pulitzer Race became a great annual contest between the American Navy and Army Departments, and the progress made under this perfectly healthy rivalry had, the lecturer said, been astounding. In 1921 the winner was the Curtiss navy racer, fitted with a 400 h.p. Curtiss engine. The speed recorded in the Pulitzer Race was 176·7 m.p.h. The 1922 Pulitzer Race was another triumph for the Curtiss organisation. This time the Army racer was the star turn, and the speed attained was 206 m.p.h., or nearly 30 m.p.h. greater than that of the 1921 winner. This great increase in speed the lecturer put down to a small extent to increased wing loading and reduced power loading, but mainly to the introduction of wing radiators. This radiator, Major Mayo said, was not due to a sudden brain-wave, but was the result of two or three years of exhaustive research, and was one of the triumphs achieved by American research workers since the War.

Coming now to the 1923 Pulitzer Race, the lecturer referred to the winning of this race by a Curtiss machine designed and built to the orders of the Navy Department. The speed recorded over the three-lap 200-kilometre course was 243·7 m.p.h., but the same machine had since set up the world's record of 266·58 m.p.h. over the measured 3-kilometre course. The lecturer gave as the main characteristics of this machine the following: Total weight, 2,097 lbs.; wing area, 148 sq. ft.; horse-power, 500; weight per sq. ft., 14·15 lbs.; weight per h.p., 4·2 lbs.; and weight of engine (dry) per h.p., 1·36 lbs. Major Mayo said it was obvious that the increase in horse-power from 400 to 500 was one of the main factors, but other features which assisted in the improvement were better streamline of the fuselage, concealed shock-absorbers inside the wheel covers, the Reed duralumin propeller, new high-speed wing section, and top wing flush with top of fuselage instead of above it on struts.

British Post-War Efforts

Turning to the post-War British efforts in high-speed machines, the lecturer said there was one British firm in particular which had appreciated the significance and importance of high-speed aircraft, the Gloucestershire Aircraft Company, and the highest credit was, he said, due to this firm and to its able designer, Mr. Folland, in spite of the complete lack of support which they had received.

Reference was then made to the first racing Gloucestershire machine, the "Mars I," with 450 Napier "Lion" engine, which represented Great Britain in the Deutsch Cup Races of 1921-22. In the latter year it should have won, as its speed was certainly higher than the winner's, but the machine was put out of the running by a mistake on the part of the pilot. On the following day it flew over the measured kilometre and recorded a speed equal to that of the Nieuport "Sesquiplan," which then held the world's record at 212 m.p.h. The lecturer then gave particulars of the latest Gloucestershire racer, the "Gloster," which won this year's Derby at a speed of 192 m.p.h. over the 200 miles. Comparing the machine with the latest Curtiss Navy racer, the load per horse-power was considerably higher and the wing loading also higher, although Mr. Folland used a high lift wing section in order to reduce the landing speed. The fuselage was admirably designed, but, unfortunately, the three-row type of engine did not lend itself to the design of a high-speed machine quite so well as the small angle V-type. The main difference between the two, however, was, the lecturer thought, in the cooling systems, where the Curtiss with its wing radiators scored heavily.

Major Mayo stated that no other British machine could lay serious claim to being a high-speed machine according to present-day American standards. He referred, however, to the good performances put up by the Bristol "Jupiter" engine in the Gourdou-Leseurre monoplane, and the Siddeley "Jaguar" in the Siddeley "Siskin."

The latter part of Major Mayo's paper was devoted to high-speed seaplanes and flying-boats, beginning with the first Schneider winner, the Deperdussin monoplane of 1913, and tracing development through the Sopwith "Tabloid," the "Savoia," the "Macchi," and the Supermarine, to the Curtiss Navy racer. Concerning the latter, Major Mayo stated that there were those who thought that a light float seaplane would not pass the navigability tests in rough weather, but there were others—and he was one of them—who thought the sturdy little Curtiss machines eminently seaworthy for racing craft. The lecturer then gave the following particulars of the Curtiss Navy seaplane racer: Weight fully loaded, 2,747 lbs.; wing area, 168 sq. ft.; horse-power, 460; wing loading, 16·35 lbs. per sq. ft.; power loading, 5·97 lbs. per h.p.; stated speed, 194 m.p.h.; speed over Schneider course, 177·4 m.p.h. In conclusion Major Mayo dealt very briefly with a few of the aspects of high-speed design with which he had not the space to deal, he said, at all adequately. These subjects included high-speed wing sections, structural strength, constructional methods, and propellers.

Future Prospects

Finally, the lecturer devoted the last section of his paper to a contemplation of future prospects. He called attention to the two great periods in the development of high-speed machines, the pre-War period and the post-War period. He could see no sign of the post-War development period coming to an end, and thought it reasonable to expect that future progress would continue to be made. Numerous channels were open, he said, for further research and experiment. For instance, there was the old question of monoplane *versus* biplane, which he did not think had been definitely settled. Then there was the retractable undercarriage, first introduced on the Dayton-Wright machine in 1920 and lately employed in the Gourdou-Leseurre, which had considerable possibilities of further development. Further refinements in resistance were possible, and even the Curtiss machine could not be said to have reached perfection. He thought it might be possible so to place the engine in the fuselage that the bulges covering the cylinder heads could be dispensed with, thus giving the nose a truly streamline form. As an instance of the importance of saving every ounce of resistance, Major Mayo stated that a resistance of 1 oz. at 60 m.p.h. required more than 1 h.p. to drag it through the air at 266·58 m.p.h., the present record speed. He thought that the Curtiss racer could, with smaller wings and further slight refinements, reach 300 m.p.h., and considered it highly probable that a speed of 350 m.p.h. would be achieved within the next two or three years.

On the question of the value of speed races, Major Mayo had a good deal to say, and said he thought it would be agreed that but for the stimulus of these international races America would not have advanced anything like as far as she had. America wanted to lead, and she realised that the encouragement of racing was the best means to achieve that end. She therefore gave the most rational form of encouragement she could. The most competent firms were given orders for experimental racing machines, and although given a free hand to produce the best they could, they were thus relieved of financial risk. The result of this policy was that America had become the leading air power for an insignificant expenditure. In solving the difficulties of high-speed flight she had acquired information and experience which placed her technically ahead of all other nations.

Apart from the military importance of maintaining high-speed work, the lecturer thought that future hope for air transport lay in the design of more efficient commercial aeroplanes, and gave as an illustration that if the cruising speed of commercial machines could be raised by 20 miles per hour without reducing load or increasing power it would revolutionise the financial aspect of commercial flying, and thought it quite possible by applying the lessons learned from the Curtiss Navy racer to achieve a good part of this extra speed in a new design of commercial machine without seriously impairing its commercial qualities. In conclusion, Major Mayo repeated that the splendid achievements of American designers in the development of high-speed aircraft had been due entirely to the fact that the American Government had properly appreciated the significance of research and experiment, and had allocated their available funds accordingly. Concerning matters at home, Major Mayo concluded as follows:—

"I submit that British air policy has been fundamentally wrong since the end of the War. British Air Votes have not compared unfavourably with those of other nations, but where has the money gone? In every possible direction except the one that matters. Research and experimental development are practically at a standstill in Great Britain because there is no money to pay for them, and yet the latest Air Estimates were for over £12,000,000. What is the use of expanding the Air Force if we allow ouselves to sink into such a position that when war comes we shall be technically out-classed by other nations?

"By her vigorous technical policy America has placed herself well ahead of any other nation in the design of high-speed aeroplanes and the development of suitable engines, and

her position as the leading Air Power is secure for some time to come. Fortunately for us, America and Great Britain will never fight against each other.

"But if it is worth while spending £12,000,000 a year on an Air Force, surely it is worth while making provision for the best possible technical equipment of that Air Force? British research workers and designers are capable of producing results as good as the best, but they must be properly backed by the Government. The American method of encouraging development is eminently sound in principle and successful in result. Would it not be worth the Government's while to follow their example and allocate, say, half a million pounds a year for the express purpose of encouraging British efforts to win the Pulitzer Race and bring back the Schneider Trophy? Whether these happy results were attained or not, the experience and knowledge gained would be cheap at the price. I do not think there would be any difficulty in finding the money if the public knew the facts."

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THE ROYAL AIR FORCE

London Gazette, November 20, 1923

Memoranda

Lieut. L. (Edmund) Cording, M.C., M.M., half-pay list, is granted rank of Capt., R.A.F., on retirement from the Army; Nov. 14.

London Gazette, November 23, 1923

Air Commodore J. M. Steel, C.B., C.M.G., C.B.E., Deputy Chief of the Air Staff, is appointed an additional Member of the Air Council; Nov. 22.

General Duties Branch

Lieut. L. E. Cutforth, R.G.A., is granted a temp. commn. as Flying Offr. on seconding for four years' duty with R.A.F.; Nov. 10. Air Commodore F. C. Halahan, C.M.G., C.B.E., D.S.O., M.V.O., is restored to full pay from half-pay; Nov. 13. Observer Offr. L. H. Stewart is placed on half-pay, Scale B; Nov. 15.

London Gazette, November 27, 1923

General Duties Branch

N. H. N. Fletcher is granted a short service commn. as a Flying Offr., with effect from, and with seny. of, Nov. 12. The following Pilot Offrs. are promoted to rank of Flying Offr.:—H. J. Wykes; June 29. J. S. Phillips; Sept. 6. M. Wiblin, B. C. Duke, L. P. Hirsh, E. S. C. Vaughan, M.C., R. B. Fleming, S. H. G. Trower, C. B. Greet, L. Young, H. W. Pierce, A. E. B. Bateman, P. J. A. Hume-Wright, D. R. Dawson; Oct. 1. G. W. Dean, B. V. Reynolds, J. V. Holman; Nov. 1.

Flying Offr. P. Chauncy is transferred to Reserve, Class A; Nov. 24. Flight Lieut. R. J. O. Compston, D.S.C., D.F.C., resigns his perm. commn. and s granted rank of Sqdn. Leader; Nov. 29. Pilot Offr. R. G. A. Vallance resigns his perm. commn.; Nov. 28. *Gazettes* July 3 and 27 concerning Flying Offr. R. B. Sutherland, D.F.C., are cancelled

Medical Branch

Flight Lieut. W. J. G. Walker is granted a perm. commn. in rank stated; Nov. 28. R. W. White is granted a short service commn. as a Flying Offr., with effect from, and seny. of, Nov. 12.

Reserve of Air Force Officers

The following are granted commns. in the General Duties Branch in the ranks stated (Nov. 27):—

Class A.—Flying Offrs. on Probn.—F. J. Bailey, G. Davis, W. C. Harveyson, T. P. Isaac. *Pilot Offr.*—J. S. Charton. *Pilot Offrs. on Probn.*—G. S. Fiske, W. George, A. J. Plummer.

Class BB.—Pilot Offr.—W. C. Kilvington.

The following Offrs. are confirmed in rank, with effect from the dates indicated:—*Flying Offrs.*—G. R. Beck; Oct. 20. D. L. Forestier-Walker, E. O. Fuller, H. Haycock, M.C., G. W. Lavington, J. McCosh, A. F. Marlowe, F. A. Smith, A.F.C., R. M. Smith, P. Wilson; Nov. 1. J. S. Arthur, M.C., J. McRobert; Nov. 8. *Pilot Offrs.*—D. M. David, E. A. Kemp, D. G. R. Lord, K. Onyett, F. E. Watts, J. E. Whitehead, D. L. H. Williams; Nov. 1.

The commn. of Pilot Offr. on probn. M. R. Dynes is terminated on cessation of duty; Oct. 23.

Memoranda

The permission granted to the following to retain rank is withdrawn on their enlistment:—Lieut. R. B. Herring; Nov. 6. Sec. Lieut. W. R. Gilmartin; Nov. 7. Sec. Lieut. N. R. E. Mattingly; Nov. 5.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Vice-Marshals: P. W. Game, C.B., D.S.O., to Air Ministry on appointment as Air Member for Personnel. 27.11.23. O. Swann, C.B., C.B.E., to H.Q., Egypt, to command on arrival.

Group Captain I. T. Courtney, C.B.E., to Basrah Group H.Q., Iraq. 23.11.23.

Wing Commanders: C. R. S. Bradley, O.B.E., to H.Q., Iraq, for Air Staff duties. 17.10.23. G. C. St. P. de Dombasle, O.B.E., to Station Commandant, Iraq, for Administrative duties. 17.10.23.

Squadron Leaders: J. C. P. Wood to H.Q., Iraq, instead of to Aircraft Depot, as previously notified. 14.9.23. E. R. L. Corballis, D.S.O., to No. 55 Sqdn., Iraq. 23.11.23. D. S. K. Crosbie, O.B.E., to No. 6 Sqdn., Iraq. 23.11.23. A. J. Capel, to No. 5 Sqdn., India. 23.11.23.

Flight Lieutenants: J. E. B. B. Maclean, D.S.C., to No. 70 Sqdn., Iraq. 10.10.23. C. J. Truran, A.F.C., to H.Q., Iraq. 14.10.23. C. S. Morice, M.C., to Station Commandant, Iraq. 27.10.23. C. H. Tancred, O.B.E., to No. 3 Group H.Q., Spittlegate. 5.12.23. S. Smith, D.C.M., to Inspector of Recruiting, London. 3.12.23. J. Cottle, M.B.E., D.F.C., to No. 8 Sqdn., Iraq. 22.10.23. V. Greenwood, to H.Q., India. 23.11.23. H. G. White to No. 28 Sqdn., India. 23.11.23. C. R. Davidson, M.C., to No. 20 Sqdn., India. 23.11.23. S. Graham, M.C., to No. 27 Sqdn., India. 23.11.23. T. G. Bowler, to H.Q., Iraq. 23.11.23. R. F. Durrant, A.F.C., to H.Q., Iraq. 23.11.23. S. P. Simpson to No. 6 Armoured Car Co., Iraq. 23.11.23. C. J. Brockbank, M.B.E., to R.A.F. Prison, Iraq. 23.11.23. A. L. Russell to No. 6 Sqdn., Iraq. 23.11.23. A. H. Goldie to No. 5 Armoured Car Co., Iraq. 23.11.23. A. R. Churchman, D.F.C., to No. 3 Armoured Car Co., Iraq. 23.11.23. R. H. Hanmer, M.C., to Basrah Group H.Q., Iraq. 23.11.23. M. Ballard to No. 4 Armoured Car Co., Iraq. 23.11.23. T. F. W. Thompson to No. 1 Sch. of Tech. Training (Boys), Halton. 14.12.23. A. H. Flower to Sch. of Army Co-operation, Old Sarum. 4.12.23.

Flying Officers: B. A. Davy to H.Q., Iraq. 26.10.23. V. F. R. Hill to Sch. of Techn. Training (Men), Manston. 3.12.23. W. Wheatley and A. H. Harrison, D.S.M., both to R.A.F. Depot. 15.12.23. C. W. Booth, M.B.E., to M.T. Repair Depot, Shrewsbury. 17.12.23. L. E. Cutforth to No. 1 Flying Training Sch., Netheravon, on appointment to a Temp. Comm. on being seconded from the Army, for course of instruction. 10.11.23. C. Chapman, D.S.C., and W. H. Stiles, both to No. 6 Sqdn., Iraq. 23.11.23. J. L. Kirby to No. 55 Sqdn., Iraq. 23.11.23. L. H. Stewart to Armoured Car Wing H.Q., Iraq. 23.11.23. F. G. Brockman and H. J. T. Russell, both to No. 30 Sqdn., Iraq. 23.11.23. E. H. Attwood to No. 45 Sqdn., Iraq. 23.11.23. G. S. Taylor to H.Q., Iraq. 23.11.23. T. Sullivan to Aircraft Depot, Iraq. 23.11.23. A. E. Groom, D.S.M., to No. 84 Sqdn., Iraq. 23.11.23. B. J. J. Nimmo to No. 3 Armoured Car Co., Iraq. 23.11.23. J. G. Shackleton, H. V. David and W. E. Cowan, all to No. 1 Sqdn., Iraq. 23.11.23. C. H. A. Farnan and R. Duncanson, both to No. 8 Sqdn. Iraq. 23.11.23. C. W. Busk, M.C., to No. 27 Sqdn., India. 23.11.23. P. H. Davy to No. 20 Sqdn., India. 23.11.23. J. W. Baker, M.C., to No. 28 Sqdn., India. 23.11.23. F. F. Garraway to No. 1 Wing H.Q., India. 23.11.23. J. Bullock and A. H. Berry, D.S.M., both to Aircraft Depot, India. 23.11.23.

All the following officers are posted to No. 1 Flying Training Sch., Netheravon, on appointment to Short Service Comms., for course of instruction. 10.11.23:—L. H. W. Axtell, C. W. Dann, M.C., B. W. Duley, M.M., W. B. O. Fox, E. V. Major, H. A. Mullaly, F. L. Woledge, T. Humble to No. 12 Sqdn., Northolt. 1.12.23. H. W. Heslop to No. 1 Sch. of Tech. Training (Boys), Halton. 14.12.23. S. N. Webster, A.F.C., to Aeroplane Experimental Estab., Martlesham Heath. 14.12.23. J. T. O'Brien Saint to Sch. of Army Co-operation, Old Sarum. 17.12.23. W. F. Davenport to R.A.F. Base, Leuchars. 7.12.23. F. E. W. Davis to No. 7 Sqdn., Bircham Newton. 5.12.23. (Hon. Flt. Lt.) T. K. Burton to Sch. of Army Co-operation, Old Sarum. 5.12.23.

Pilot Officers: H. C. Evans to No. 1 Flying Training Sch., Netheravon, on appointment to a Permanent Comm. for course of instruction. 10.11.23. B. R. C. Coope, A. S. Hutton, and G. H. Rawlinson, all to Aircraft Depot, India. J. S. Phillips, D. R. Dawson, A. M. Rowe, and E. C. Roark, all to No. 70 Sqdn., Iraq. M. B. F. Watson to No. 1 Sqdn., Iraq. A. Malone and W. H. Ryder, both to No. 45 Sqdn., Iraq.

All the following officers are posted to No. 1 Flying Training Sch., Netheravon, on appointment to Short Service Commns. (on probation), for course of instruction. 10.11.23:—J. A. Bramley, E. A. C. Bushell, J. H. Caulfeild, C. F. Caunter, E. R. H. Coombes, C. H. A. Denny, D. J. Dorey, H. St. E. Dracott, C. V. Fevez, G. D. Hamilton, B. W. Hemsley, J. C. Hill, H. A. Le Feuvre, A. C. C. Mason, M. M. Miln, T. A. Hale-Monro, W. J. Pearson, I. B. Pigott, V. A. C. Ross, P. Slocombe, P. Stainer, C. G. C. Sullivan, H. St. George-Taylor, C. U. G. Tristram, J. A. Wall, and St. J. F. Wintour.

Stores and Accountants Branch

Squadron Leaders: C. L. Archbold, to R.A.F. Depot on transfer to Home Estab. 1.11.23. W. Millett, to R.A.F. Depot on transfer to Home Estab. 13.10.23. H. E. J. Hewitt to H.Q., Iraq.

Flight Lieutenants: W. G. MacD. Nicholl, to R.A.F. Depot on transfer to Home Estab. 21.10.23. C. C. J. Croydon (Accountant), to R.A.F. Depot, on transfer to Home Estab. 13.10.23. W. R. P. Allen to Basrah Group H.Q., Iraq. H. L. Woolveridge to Air Ministry. 23.11.23. A. R. Thomas (Accountant) to H.Q. Accounts Office, Iraq.

Flying Officers: F. C. P. Roberts, to R.A.F. Depot (non-effective pool) on transfer to Home Estab. 4.11.23. G. G. C. Pigott, to R.A.F. Depot (non-effective pool) on transfer to Home Estab. 13.10.23. A. P. Woollett, to R.A.F. Depot on transfer to Home Estab. 21.10.23. R. H. Latham, to remain at Marine and Armament Experimental Estab., Isle of Grain, instead of to No. 4 Stores Depot, as previously notified. H. C. F. Ellis (Accountant), to Aeroplane Experimental Estab., Martlesham Heath. 10.12.23.

Flying Officers: T. L. Grey to Aircraft Depot, Iraq. A. T. Wells to No. 6 Sqdn., Iraq.

Pilot Officers: R. A. Dolton and A. J. Grant, both to Aircraft Depot, India.

Chaplains Branch

Rev. P. C. C. Lamb, M.A., to No. 2 Flying Training Sch., Duxford, on transfer to Home Estab. 1.11.23. Revd. J. H. P. Still, B.A., to H.Q., Iraq.

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CORRESPONDENCE

AMATEUR-BUILT LIGHT 'PLANES

[**2079**] In connection with your proposed "knock-down" system of light aeroplane construction, might I suggest a series of loading tests (sand or otherwise) on the finished machine in the presence of an A.I.D. official or representative of the firm supplying the parts, and then granting an airworthiness certificate? As failure under test would wreck a lot of work and parts, it might serve to eliminate bad workmanship.

As to finish, a firm might subscribe its name to the machine only if it was satisfied as to this.

W. E. GRAY

Berwick-on-Tweed

BY DOUGLAS B. ARMSTRONG

The "Aerosemist"

REVIEWING a newly-published treatise on "Aero Stamp Collecting," Mr. Gavan Duffy, one of the foremost exponents of the air postage cult, coins a new definition for the collector of air mail material—he dubs himself an "aerosemist."

The expression is not a particularly engaging one, but it is by far the best that has been put forward as yet. Certainly it is preferable to the term "aero-philatelist," which carries with it the implication that the collecting of air post items is merely a side line of philately—a point of view that calls forth vigorous protest from Mr. Duffy, who comments :—

"The two pursuits are, of course, as distinct as chemistry and biology, or, shall I say, as the theatre and the kinema, and there is no imaginable reason why the peculiar standards of stamp collecting should be forced upon the more vigorous and up-to-date enthusiast for air mail. The one finds his main interest in the stamp as a stamp, the other in the stamp or entire as a development in aerial mail."

This is the view that has been advocated consistently in this column, and is shared, we believe, by the majority of aerosemists, many of whom have no interest in the study of philately *per se*.

Danzig Error

A SCARCE and interesting error of the 5,000,000 mark aero stamp of Danzig, recently chronicled, has been brought to our notice by Mr. W. E. Hughes. It arises, apparently, from the insertion of a wrong cliche in the electrotyping forme, the seventy-third stamp in each sheet being of the original face value 10,000 mk., instead of 50,000 mk. upon which the "5 Millionen" surcharge is normally applied. As it is understood that flying has been suspended for the winter and the air stamps are accordingly rendered obsolete, it is possible that this aero error will prove elusive.

Syrian Air Posts

FROM the Syrian State of Lebanon comes a curious semi-official air post label in the form of a roughly executed map of the province, marked with the main routes, railway and air lines, printed in red and blue, with inscriptions in French and Arabic reading "Syrie-Leban—Aviation Civile 1 Piastre Syrienne." The design also includes an aeroplane flying over the sea, towards the coast.

Previous issues of Syrian air post stamps have all been made under military auspices, in connection with the army air lines between Aleppo and Alexandretta, Damascus and Swedia, Damascus and Palmyre, Latakia and Homs, and Aleppo and Deir el Zoor. The first set of three values overprinted "POSTE PAR AVION" on ordinary postage stamps of the French military occupation appeared on December 1, 1920. This was followed in June, 1921, by a second series, similarly overprinted, but upon different denominations. In October of the same year the form of overprint was modified to the single word "AVION," impressed vertically in small Roman capitals. As these stamps were never on sale to the public, they are extremely hard to obtain in unused condition.

Proposed U.S.A. Speed Stamp

ACCORDING to the American press, the Aeronautical Chamber of Commerce has proposed to the United States Post Office Department the creation of a special speed postage stamp to ensure transmission by aeroplane, express train, motor-car or fast steamer.

A questionnaire is being circulated amongst commercial associations throughout the country, with a view to securing more extensive use of aeroplanes in the postal service.

Readers are invited to forward to the Editor of* FLIGHT *letters, etc., bearing aerial stamps or postmarks for mention in this column, as well as out-of-the-way varieties, etc.

We shall also be pleased to hear from correspondents interested in air-stamp collecting, and to answer any queries.

PUBLICATIONS RECEIVED

Cycling Manual. 5th Edition. London: Temple Press, Ltd. Price 1*s*. net.

The Accessory. Vol. 9, *No.* 99, *November*, 1923. Brown Brothers, Ltd., Great Eastern Street, E.C. 2.

Law of the Car. Edited by W. Gordon Aston. London: Percival Marshall and Co. Price 2*s*. 6*d*. net.

Physical Energy. By Bombardier Billy Wells. London: T. Werner Laurie, Ltd. Price 3*s*. 6*d*. net.

British Birds. Vol. XVII, No. 6. *November*, 1923. London: H. F. and G. Witherby, 326, High Holborn, W.C. Price 1*s*. 9*d*.

Revue Juridique Internationale de la Locomotion Aérienne. November, 1923. Edition Aérienne, 4, Rue Tronchet, Paris.

A Government Committee of Enquiry and the Light Metal Artificial Leg. By Capt. H. H. C. Baird, D.S.O., Bridge, near Canterbury. Price 2*d*., post free.

Transactions. Vol. LXVII., Part I. November, 1923. Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow.

U.S. National Advisory Committee for Aeronautics: Report No. 166.—The Aerodynamic Plane Table. By A. F. Zahm. *Report No.* 169.—The Effect of Airfoil Thickness and Plan Form on Lateral Control. By H. I. Hoot. *Report No.* 171.—Engine Performance and the Determination of Absolute Ceiling. By Walter S. Diehl. *Report No.* 172.—Dynamic Stability as affected by the Longitudinal Moment of Inertia. by Edwin B. Wilson. National Advisory Committee for Aeronautics, Washington, D.C., U.S.A.

De la Responsabilité des Compagnies de Navigation Aérienne. By Jacques Batigne. Edition Aérienne, 4, Rue Tronchet, Paris. Price 10 frs.

Elementary Aeronautical Science. By Ivor B. Hart and W. Laidler. Oxford: The Clarendon Press. Price 7*s*. 6*d*. net.

Aeronautical Research Committee, Reports and Memoranda: No. 854 (Ae. 94).—The Measurement of Aeroplane Speed with Special Reference to the Use of a Suspended Static Head. By H. L. Stevens. October, 1922. H.M. Stationery Office, Kingsway, London, W.C. 2. Price 9½*d*., post free.

NEW COMPANIES REGISTERED

THE AIRSHIP GUARANTEE CO., LTD.—Capital £5,000, in £1 shares (3,000 "A" and 2,000 "B"). The "A" and "B" shares rank pari passu as one class, except that in a winding-up the "A" shares rank first for repayment of capital. Bankers, financiers to build airships, aeroplanes, etc. Solicitors, Linklaters and Paines, 2, Bond Court, Walbrook, E.C.

TRAVELLING ELECTRIC NIGHT SIGNS, LTD., 11, Essex Street, Strand, W.C.—Capital £500, in 1*s*. shares. Advertisement contractors; to produce and develop advertising by means of aircraft, airships, aeroplanes, seaplanes, helicopter or other aerial machine, etc. Permanent directors, F. W. Fitton, D. De Kavanagh, and J. T. Coulson.

AERONAUTICAL PATENT SPECIFICATIONS

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1922

Published December 6, 1923

12,898. A. V. ROE AND CO., LTD., and R. CHADWICK. Aeroplanes, etc. (206,537.)
12,900. A. V. ROE AND CO., LTD., and R. CHADWICK. Socket and spigot joints for tubes, etc. (206,538.)
13,167. A. E. BREWERTON. Gyro-compasses. (206,541.)
18,270. LUFTSCHIFFBAU-ZEPPELIN-GES. Anchoring-devices for airships. (182,792.)
21,122. ENGLISH ELECTRIC COMPANY, LTD., and W. O. MANNING. Planes. (206,562.)
21,644. DORNIER METALLBAUTEN GES. and C. DORNIER. Method of manufacturing hollow bodies for airships. (206,589.)
28,231. R. PIKE. Screw propellers. (206,676.)
30,235. SOC. ANON. DES ATELIERS D'AVIATION L. BREGUET. Two-cycle I.C. motors. (188,655.)

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* *European subscriptions must be remitted in British currency*